

DESIGN GUIDELINES

USAREUR - Restoration Program of Troop Billets - Standard 1+1

		SOURCE	
B 12	VENTILATION SYSTEM		B 01
B 12.1	Standards and Guidelines		
The design shall be based upon German standards and guidelines. If U.S. Forces standards contain more stringent requirements, the U.S. standards shall be applied.			B 02
B 12.2	Marking		
All equipment and piping shall be identified with laminated presswood signs with permanently engraved lettering in German and English.			B 03
Function schematics of built-in system, permanently protected, CAD-quality (computer-aided-design) shall be posted in central mechanical plants.			B 04
B 12.3	Selection of Duct Material		
Exhaust air lines of spiral rabbet pipe as per DIN 24145		DIN 24145	
Exhaust air lines of bathroom ventilation optional of spiral rabbet pipe or of mineral material Vermiculite.			B 05
Wall thickness acc. to DIN 1946.		DIN 1946	
Connections to exhaust air fans with flexible pipes as per DIN 24 146.		DIN 24146	B 06
B 12.4	Selection of Ventilation System		
Basic erection as decentral ventilation system in accordance to DIN 18017 with reflow of adjacent areas.		DIN 18017	B 07
If fire protective doors are installed in corridors, overflow openings with fire protection facility shall be installed in the area above doors.			B 08
The total air balance (schedule concerning escaping air and therefore required reflow) shall be provided for a building. The designer shall investigate depending on the building structure if required air can be reflow out of building. Approximate values for the possibly reflowing exterior air is shown in DIN 1946 Part 6.			B 09
If the reflowing air is insufficient, overflow openings from outside shall be constructed.			B 10
Preferably, overflow openings from outside shall be arranged at the front sides of corridor in basement.			B 11
These overflow openings shall be accomplished in such a way that a cooling of room is avoided. Self-closing flaps and weather protective screeds shall be used. If possibly, the exterior air shall flow via radiators.			B 12
A heat recovery is not planned. A combination of latrine exhaust air and exhaust air of other rooms is not acceptable.			B 13
			B 14
			B 15

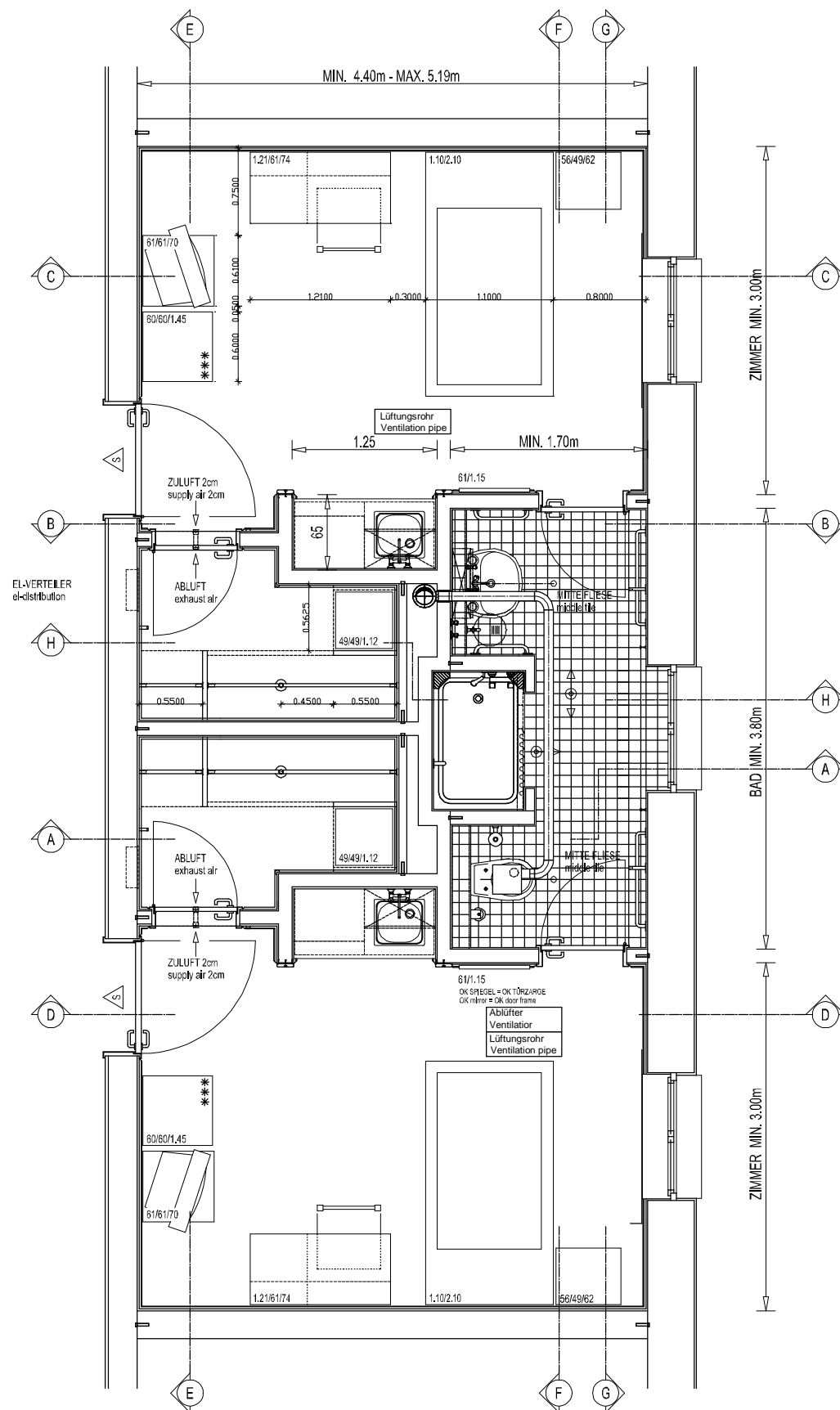
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		SOURCE
B 12.5 Pipe Routing Exhaust air openings towards outside located below the floor level will be led into light wells. Pipe routing bathrooms of bedrooms A possible pipe routing within the bathrooms / bedrooms is shown in Fig. 11.5-1 up to Fig. 11.5-5		B 01
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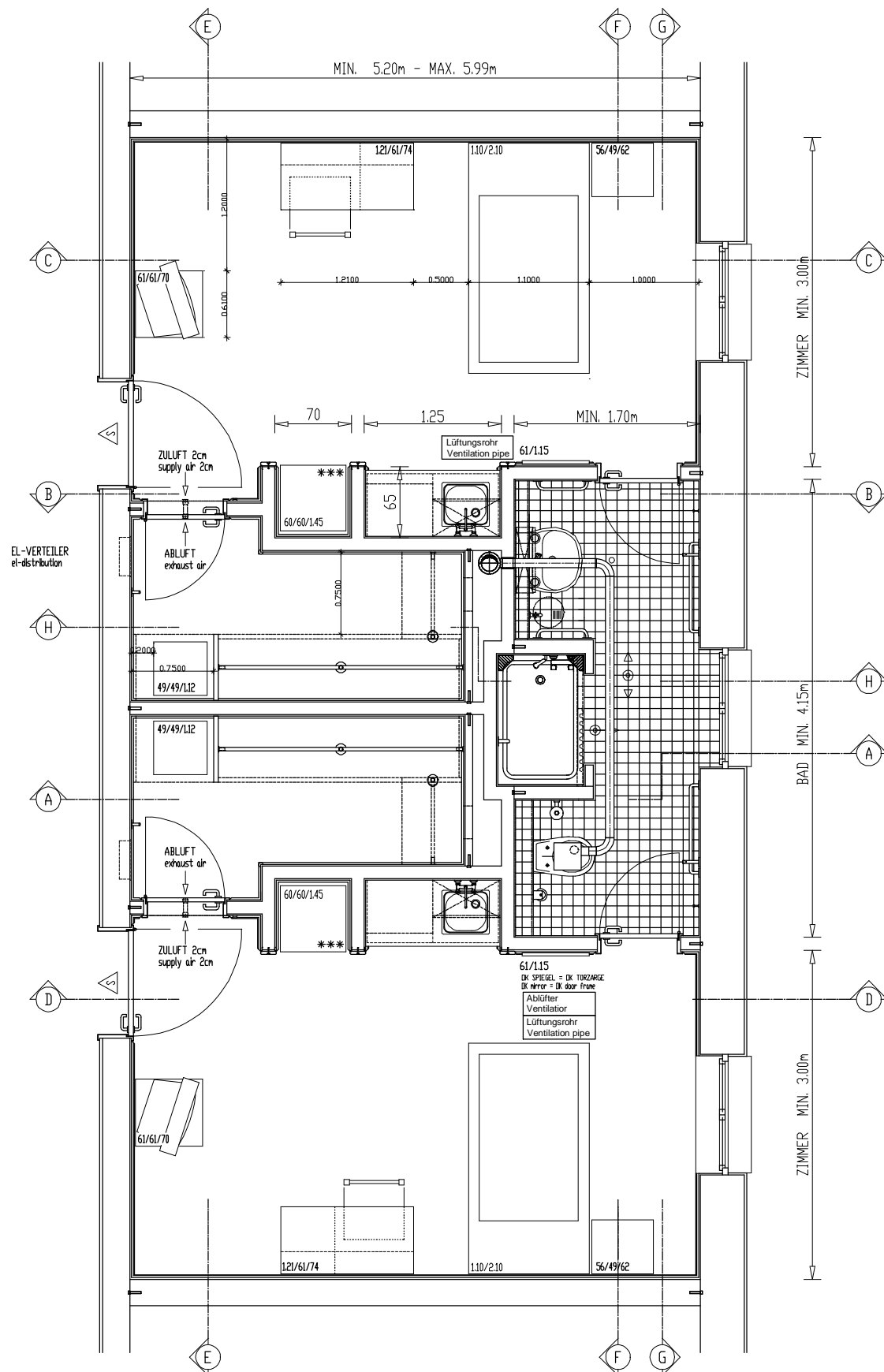


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Fig. 12.5 – 2 Example layout Type 2



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STANDARDGRUNDRISS AB 6,00m

ZIMMER MIN. 4.30m

SCHRANKR. MIN. 1.55m

121/61/74

56/49/62

110/210

49/49/112

61/61/70

OK SPIGEL = OK TORZARGE
OK mirror = OK door frame
61/115

ZULUFT 2cm
supply air 2cm

ABLUFT
exhaust air

MIN. 0.90m

65

61/61/70

Abblüf-
Ventilator
Lüftungsrohr
Ventilation pipe

61/115

60/60/145

EL-VERTEILER
el-distribution

ZULUFT 2cm
supply air 2cm

121/61/74

56/49/62

110/210

49/49/112

SCHLAFZIMMER MIN. 1.50m

SCHRANKR. MIN. 3.10m

ZIMMER MIN. 3.10m

BAD MIN. 1.80m

70

1.25

1.25

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MIN. 4.40m

121/61/74

110/2/30

56/49/62

61/61/70

66/60/145

0.7500

0.6100

0.6000

1.2100

0.3000

1.1000

0.8000

DACHSCHRÄGE
HOHE 2.20m

1.25

MIN. 1.70

ZULUFT 2cm
supply air 2cm

ABLUFTE exhaust air

61/115

Lüftungsrohr
Ventilation pipe

65

49/49/112

0.5625

0.5500

0.4500

0.5500

EL-VERTEILER
el-distribution

95

61/115
OK SPIEGEL = OK TÜRZARGE
OK mirror = OK door frame

Abflüßer
Ventilator
Lüftungsrohr
Ventilation pipe

ABLUFTE exhaust air

ZULUFT 2cm
supply air 2cm

61/61/70

66/60/145

121/61/74

110/2/30

56/49/62

DACHSCHRÄGE
HOHE 2.20m

ZIMMER MIN. 3.00m

BAD MIN. 3.80m

ZIMMER MIN. 3.00m

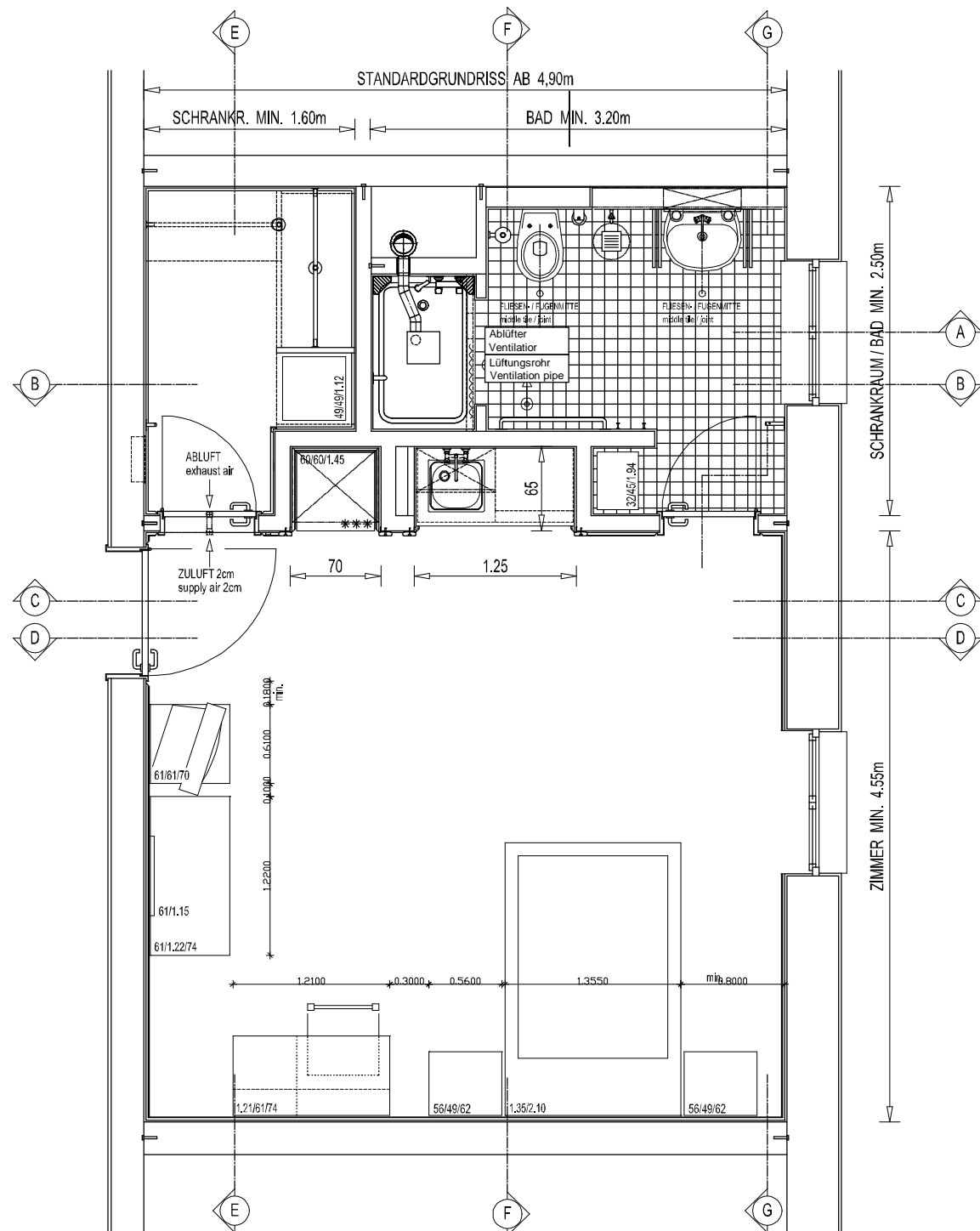
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Fig. 12.5 – 5 Example layout Type 5



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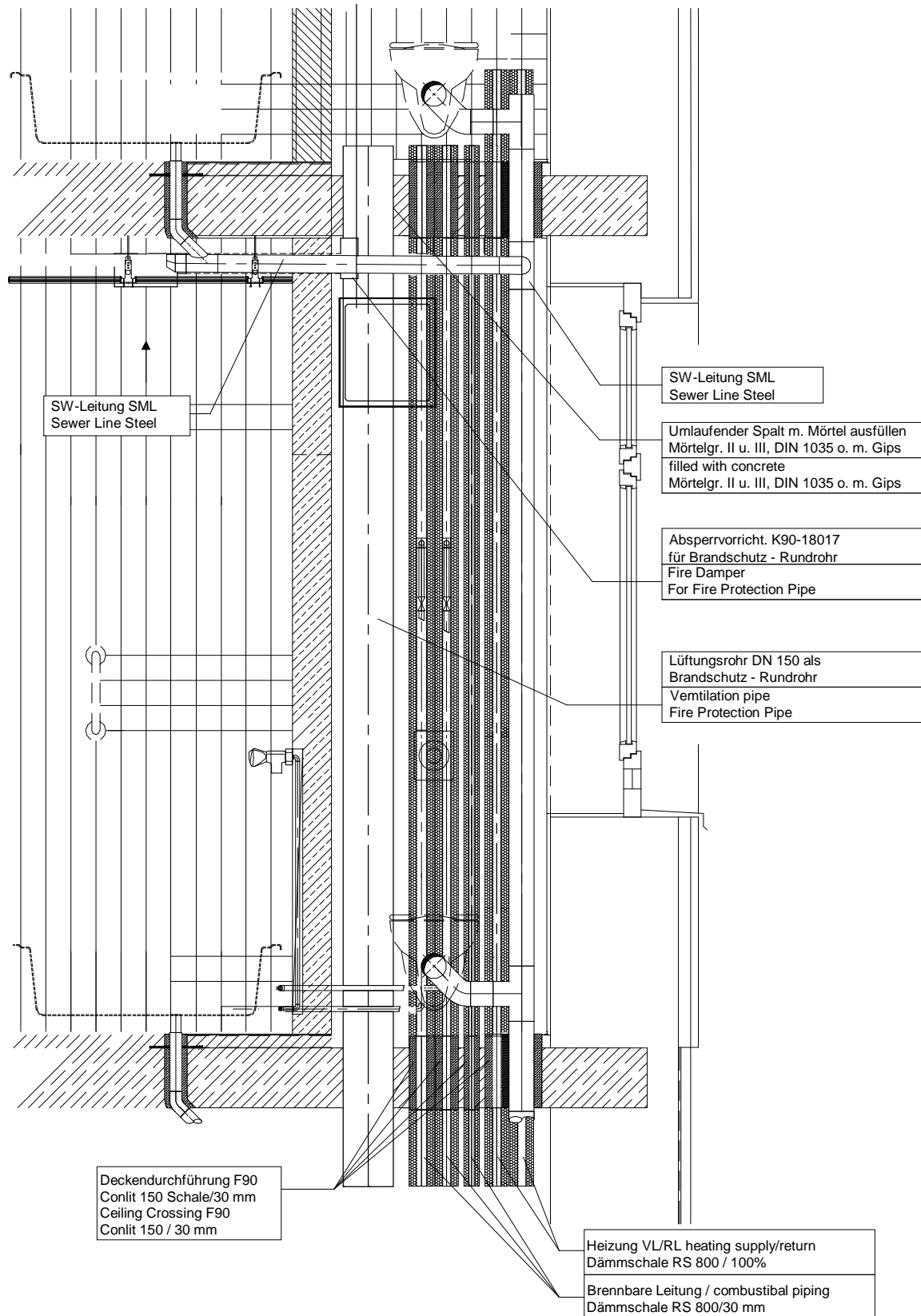
		SOURCE	
B 12.6	Thermal insulation	DIN 4109	B 01
If accumulation of condensation must be anticipated, exhaust air lines shall be insulated diffusion-tight.			B 02
B 12.7	Sound Insulation Requirements		B 03
Applicable are the guidelines of DIN 4109 as well as of DIN 1946. Sound insulation inlays shall be used for pipe fastening devices. Decoupling of pipes from the structure is important.		DIN 4102 LBO NFPA	B 04
Pipe sound absorbers shall be installed between the exhaust air lines of women and men areas at the exhaust air system of public latrines in basement as well as in attic at joint exhaust air system.			B 05
B 12.8	Fire Protection Requirements		B 06
Pipe penetrations through fire sections shall be protected against flame transmission under consideration of DIN 4102, District Construction Ordinance and U.S. requirements.			B 07
System solutions for pipe penetrations through fire sections are acceptable.			B 08
The dependence between proper accomplishment of ceiling/wall passage acc. to sound insulation guidelines under consideration of fire protection at the same time shall be strictly observed.			B 09
Especially, this means:			B 10
1. Openings and/or chases shall be kept as small as possible			B 11
2. Remaining openings shall be closed with incombustible construction materials.			B 12
3. Required coverings (sound insulation) in the area of openings shall be accomplished with mineral fibers showing a melting temperature of min. 1000°C.			B 13
4. The flush mounted installation of remaining rest wall thickness at staircases and fire sections shall reconstruct the fire resistance class of construction element.			B 14
A fire protection element against flame transmission in ventilation systems with classification acc. to K90 – DIN 18017 and general construction supervision allowance shall be used at use of spiral rabbet pipe as ventilation pipe and shut-off facility in the ceiling in a joint shaft with further combustible construction materials.			B 15
For accomplishment of installation shafts see Fig. 12.8			
Insulation of installation pipes with insulation material class A1.			
Make	Rockwool		
Type:	Conlit		
Ceiling penetrations with Conlit shells.			
Further accomplishments to theme fire protection, see chapter B 04.			

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SOURCE

Fig. 12.8 Manhole detail at use of fire protection pipe



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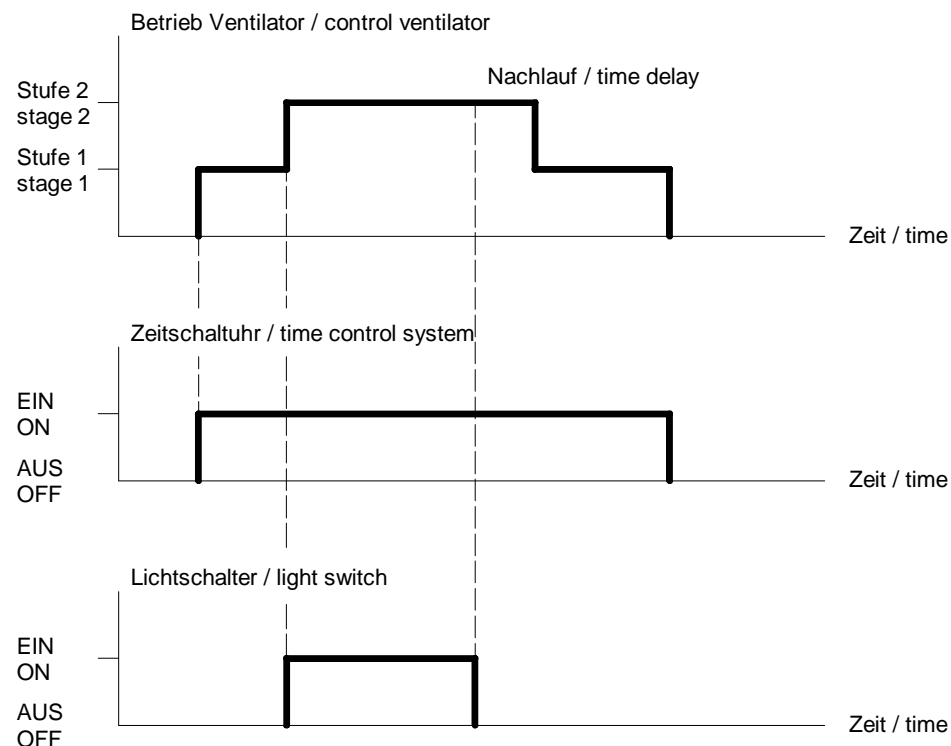
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		SOURCE
B 12.9	Equipment	B 01
B 12.9.1	Bathrooms bedrooms	
Bathrooms will be equipped with a two-level exhaust air ventilator additionally to the natural ventilation.		B 02
Level I as basic load will be driven for permanent operation. The turning on/off will be accomplished via a central signal of CCMS and/or timer. Cutoff of ventilator between 1000 hrs and 1600 hrs and 2300 hrs and 0600 hrs.		B 03
Level II will be turned on via light switch of bathroom. The cutoff will be accomplished time delayed via follow-up relay.		B 04
The follow-up relay shall be placed in ventilator.		
The control course is shown in Fig. 12.4.		B 05
The electrical connection occupation of ventilator is as follows: Clamp 1 Zero conductor Clamp 2 Permanent phase (follow-up operation) Clamp 3 Phase basic load Clamp 4 Phase full load		B 06
The fan shall be delivered incl. thermal overload protection in protective type IP 45.		B 07
Installation of ventilator in intermediate ceiling above latrine. The ventilator will be installed above the shower at room-high bricking of showers.		B 08
Capacity data: Basic load approx. 30 m³/h ~ 1.5 fold LW Full load approx. 100 m³/h ~ 5.0 fold LW The volume flows can vary in the range of $\pm 10\%$.		B 09
The roof passage and/or blowing out or deflector hood shall be accomplished in roof color.		B 10
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Fig. 12.9.1 Control course bathroom ventilation



B 12.9.2 Kitchen

Connection of vapor exhaust hood. Exhaust air through exterior wall via weather louver into the atmosphere. Weather louver with automatically closing damper to prevent cooling down of room.

B 12.9.3 Janitor's closet

A fan with one speed stage shall be mounted in addition to natural ventilation. Control of fan via light switch with follow-up relay. Volume flows equivalent to at least **4-fold** air change. Exhaust air discharge directly through the exterior wall.

The exhaust air line shall be led directly through the roof towards outside in janitor's closets in attic. The roof opening resp blowing out or deflector hood shall be accomplished in roof color.

Reflow out of hallway via fire protection facility.

Make STRULIK

Type s,xit

Principle structure see Fig. 12.9.3

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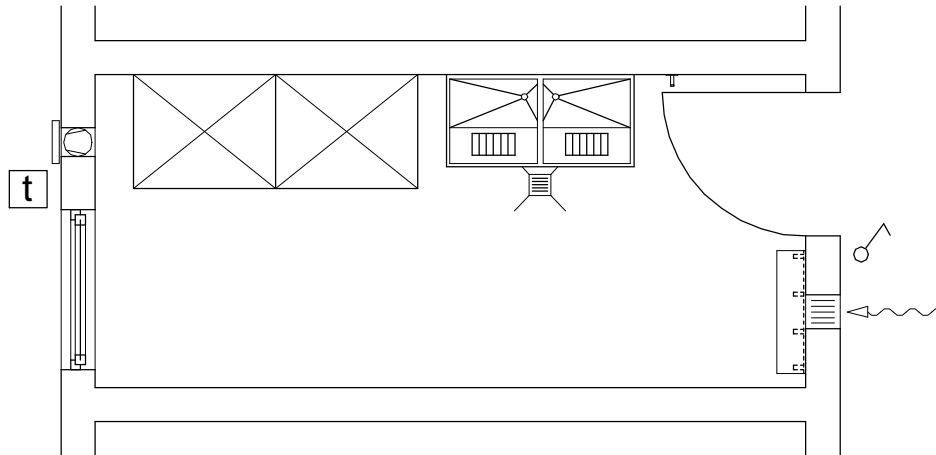
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SOURCE

Fig. 12.9.3 Principle structure exhaust air janitor's closet



B 12.9.4 Mechanical rooms

Ventilation of mechanical rooms via fan with one speed stage. Control of fan via room thermostat and timer. Room thermostat is adjustable in a temperature range from 20° C to 30°C.

The timer overrides the room thermostat and switches the fan at least once a day for an adjustable time (switching time is freely selectable from 10 minutes to 1 hour).

Volume flow in accordance with performed calculation, however, not less than **2-fold** air change.

Air flow via weather louver from exterior area. Weather louver with automatically closing damper to prevent cooling down of room.

B 12.9.4.1 Ventilation electrical rooms

The electrical rooms shall be mechanically ventilated.

Control of exhaust air fan via a room thermostat acc. to system ventilation mechanical rooms.

If a central battery will be erected in building, it shall be ventilated directly towards outside.

Principle structure see **Fig. 12.9.4**

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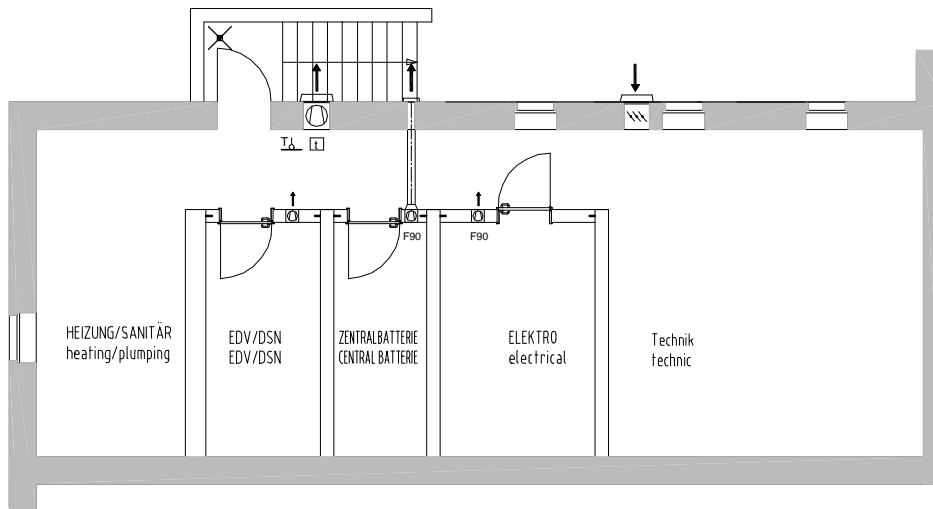
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SOURCE

Fig. 12.9.4 Principle structure ventilation mechanical central office



B 12.9.5 Latrines Female / Male Basement

Separate exhaust air ventilators for mechanical ventilation of rooms.

One-level exhaust air ventilator with approx. **10-fold** air change.

Control of ventilator via light switch with follow-up relay.

Make STRULIK

Type s,xit

Fig. B 12.9.5 shows a principle system structure. This structure shall be used appropriately for the latrines women.

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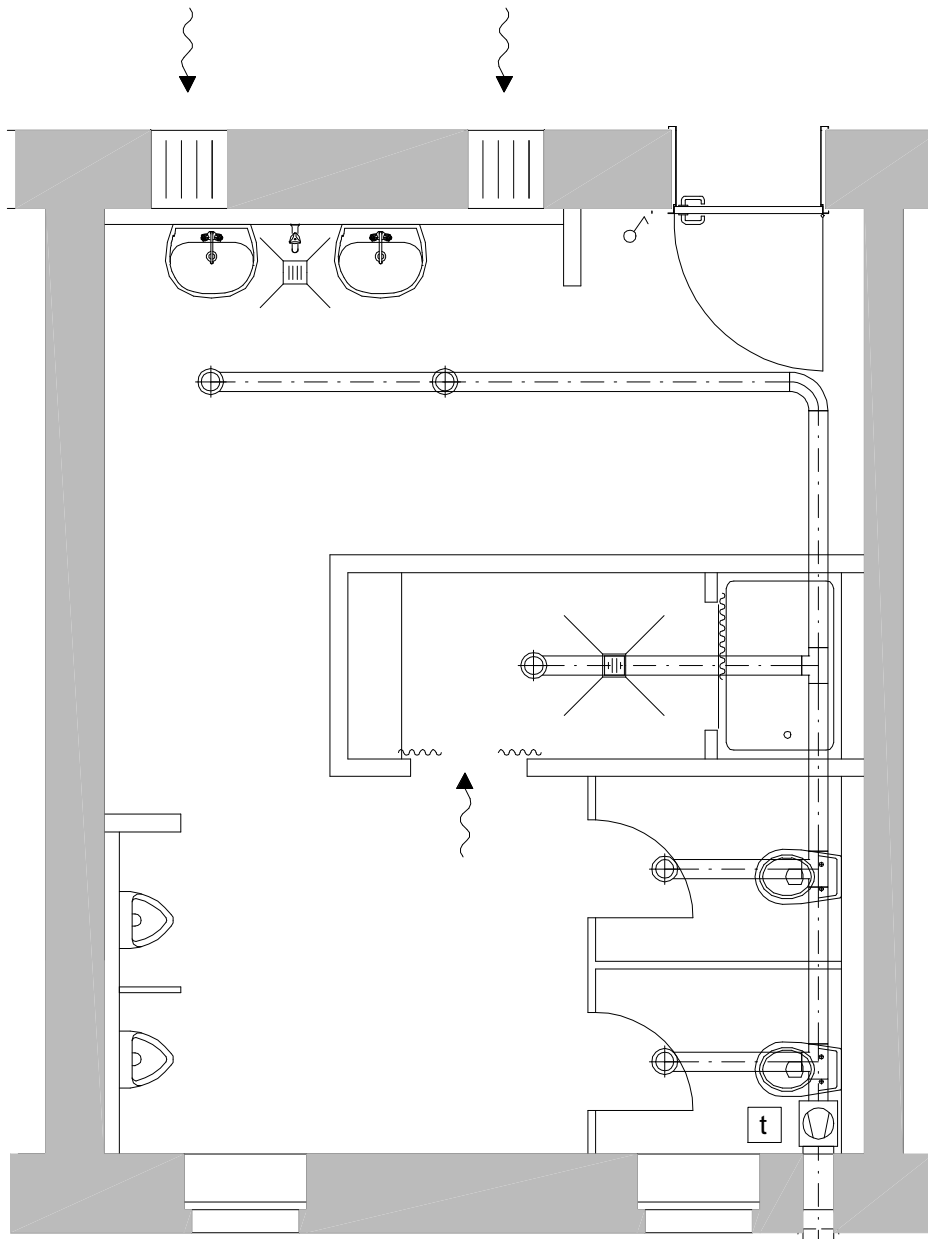
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SOURCE

Fig. B 12.9.5 Principle structure ventilation latrines basement



Exhaust air via weather louver via light well or directly to the atmosphere. Weather louver with automatically closing damper to prevent cooling down of room.

B 12.9.6 Laundry

The ventilation of laundry will be accomplished via installed dryers and a wall ventilator. The fan shall be dimensioned for a **10-fold** air change. The fan will be switched via a moisture sensor.

Adjustment range between 50% - 90% rel. humidity. With follow-up relay adjustable between 5 - 20 Minutes.

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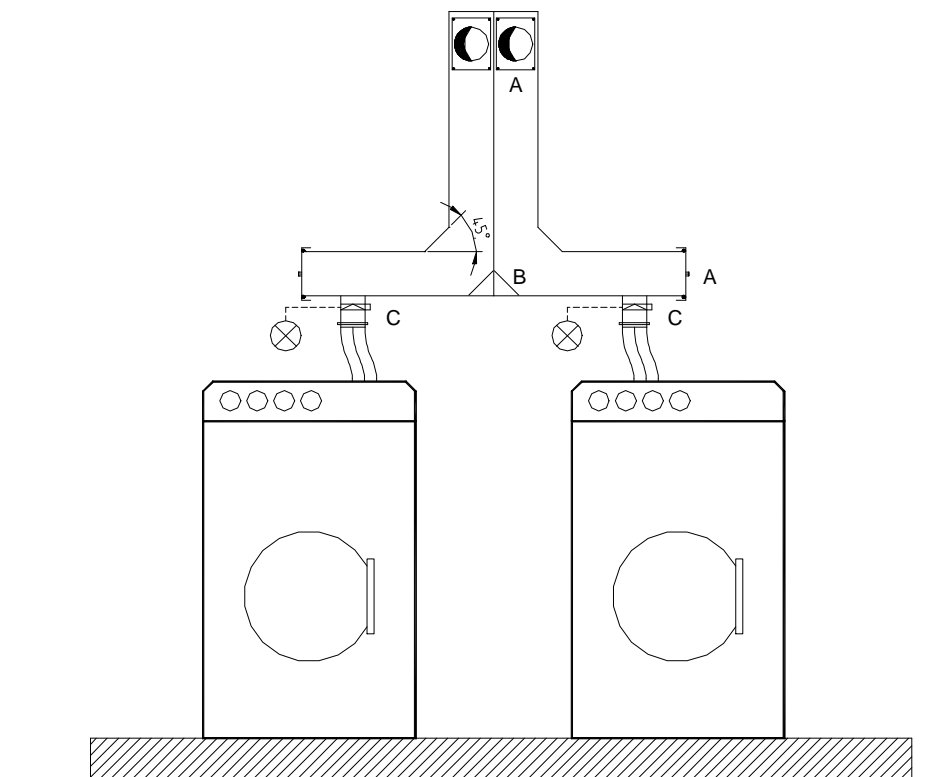
SOURCE	
B 12.9.6.1 Dryer exhaust air	B 01
The technical rule ETL 1110-3-483 Engineering and Design CLOTHES DRYER EXHAUST VENTING is the basis for dimensioning of dryer exhaust air. The guideline can be obtained under following internet address: http://www.tga-net.de/deutsch/knowhow/etl-483/et-483.pdf .	B 02
The air quantity to be calculated per dryer amounts between 300 and 380 m³/h. The exact values shall be obtained at responsible DPW prior to commencement of accomplishment.	B 03
The dryers shall be preferably installed at the exterior wall. Each two dryers shall be ventilated directly towards outside via an exhaust air form part acc. to Fig. 12.9.6.1. The air volume flows shall be conducted separately in exhaust air form part.	B 04
If this type of installation is not possible, up to 4 dryers can be connected to a collecting duct without additional escaping acc. to ETL 1110-3-483. The dimensioning shall be accomplished acc. to following rules.	B 05
1. Bypasses shall be accomplished with max. 45°. Conducting plates shall be provided.	B 06
2. Max. 2 bows are acceptable.	B 07
3. An exhaust air ventilator shall be provided at duct lengths more than 7 m and/or at more than 2 bows.	
4. The air speed in collecting pipe shall be approx. 6 m/s.	B 08
A fluffing sieve shall be provided per dryer. The fluffing sieves shall be monitored to soiling (differential pressure measurement) and shown clearly visible near the appropriate fluffing sieve (red signal lamp).	B 09
Cleaning openings shall be provided at least every 2 m. Cleaning openings acc. to Fig. 12.9.6.1 shall be provided at direct connection towards outside.	B 10
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SOURCE

Fig. 12.9.6.1 Connection detail dryer exhaust air with two dryers



- A** Cleaning opening
- B** Conductive plate
- C** Fluffing sieve with optical monitoring

Reflow

The required reflow air quantity shall be determined acc. to above mentioned information.

A simultaneousness of 100% shall be estimated. It shall be secured that no damages at dryers will arise at the operation of all dryers at the same time.

The reflow will be provided via overflow openings out of corridor and from outside if required.

The distribution of air quantities shall be as follows:

1. The air shall reflow out of corridor via fire protection technical facilities at max. 6 dryers. See also item B 12.4.
2. The required air for additional dryers shall reflow from outside at more than 6 dryers.

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The exterior air shall be heated in order to prevent cooling down of room. Fan convectors with warm heater heating can be used for this. If a fan convector is used, it shall be used for heating of room.

At minor exterior air quantities it is sufficient to supply the air via radiators. The radiator shall be installed to the exterior wall for this purpose.

Control description

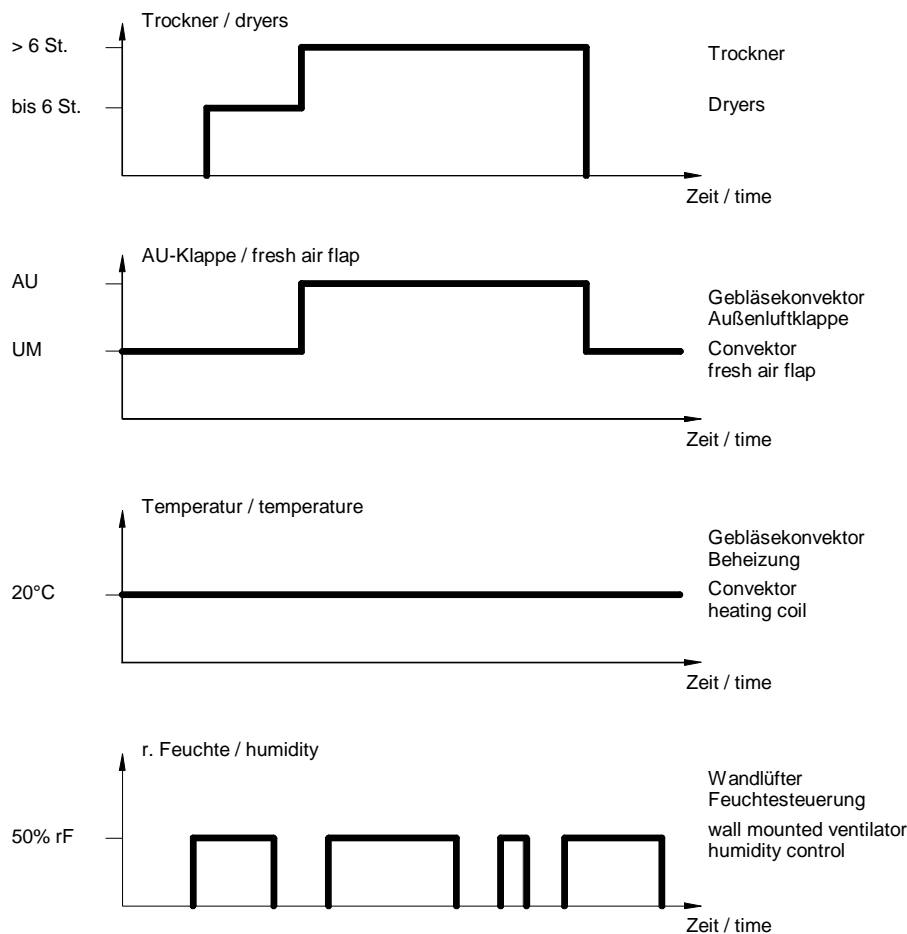
Fig. 12.9.6.2 shows a control course.

The heat capacity of fan convectors will be controlled by the room temperature.

The wall ventilator will be controlled via room humidity.

The circulating air flap of the fan convector will be switched to exterior air as soon as more than 6 dryers are in operation.

Fig. 12.9.6.2 Control course laundry



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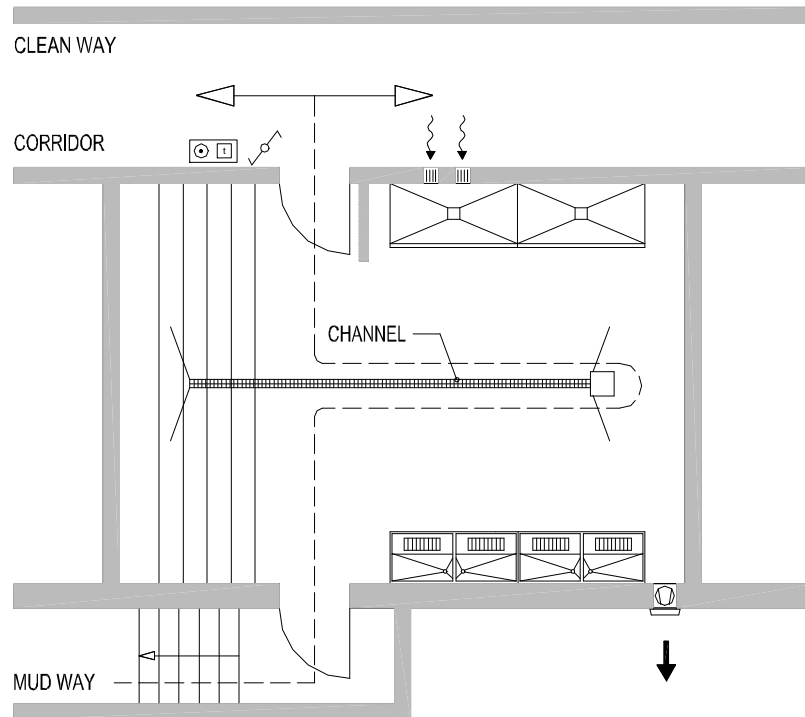
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SOURCE		
B 14 Page 397	B 12.9.7 Office rooms and / or storage rooms	B 01
	The exact room use shall be determined with USAREUR prior to commencement of design.	
	B 12.9.7.1 Office rooms	B 02
	A wall fan shall be installed in rooms without exterior windows. Not less than 4-fold air change. Control via light switch.	
	Reflow via fire protection facility	B 03
	Make STRULIK	
	Type s,xit	
	of corridor.	
	Exhaust air is discharged into atmosphere via weather louver. Weather louver with automatically closing damper, to prevent cooling down of room.	B 04
	B 12.9.8 Arms room	
	No dehumidification of the arms room.	B 05
	B 12.9.9 Mud room	B 06
	One fan with one speed stage shall be mounted in addition to natural ventilation. Control of fan see	
	A push button mounted outside, next to the door, shall furthermore actuate the fan for a freely selectable follow-up time (follow-up time is selectable from 10 min to 1 hour). The follow-up time shall be changeable in the electrical distributor cabinet.	B 07
	Volume flows equivalent to 10-fold air change.	B 08
	Air flow from corridor via fire protection equipment.	
	Make STRULIK	B 09
	Type s,xit	
	Exhaust air is discharged to the atmosphere via weather louver. Weather louver with automatically closing damper to prevent cooling down of room.	B 10
	Fig. B 12.9 shows a principle system structure.	B 11
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Fig. 12.9 Principle structure ventilation mud room



B 12.9.10 Latrines Female / Male Attic

System structure acc. to B 12.9.5

Volume flows equivalent to **2-fold** air change.

The exhaust air line shall be led directly through the roof towards outside. the roof passage and/or blowing out or deflector hood shall be accomplished in roof color.

B 12.9.11 Storage bin rooms Attic

A wall fan shall be installed in rooms without exterior windows.

Volume flows equivalent to **0.5-fold** air change.

Control via light switch with follow-up relay.

Air flow from corridor via fire protection equipment.

Make STRULIK

Type s,xit

Exhaust air via the roof.

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